

The Beaver Lake Monitor

A publication of the Beaver Lake Management District Advisory Board

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Your Next Door Neighbors: raccoons

This is the first article in a series about the wild and not-so-wild animals living around Beaver Lake: their life cycles, needs, and habits; their impacts on you and your impacts on them; and some strategies for maintaining your property and safety, while enjoying life in a place where wildlife is part of every day. Our first subject will be raccoons, to be followed by deer, beavers, coyotes, and bears. If you have another animal you would like featured, please let us know!

Raccoons evoke a wide range of emotional responses from their human neighbors, ranging from admiration for their adaptability and sentimentality at their cuteness to frustration with their garden plundering and fear for the safety of small pets and children in encounters. They have found ways to thrive next to human occupation and are actually more common in and around urbanized areas than in the wilderness.

Life cycle, food, and habitat

Raccoons usually live only about 2-3 years on their own, although captive raccoons have lived as long as 15 years. Their main predators include hunters, cougars, coyotes and dogs. Accidentally being hit by cars is a common cause of death, as is disease and occasionally starvation, especially for the young.

Adult raccoons usually live alone, except during mating season. The young stay with their mothers until they are a little less than a year old, although they can feed on their own within weeks of birth. Sometimes when food is very abundant, raccoons

will feed together as a group. Occasionally young males will band together to protect themselves against dominant males, and females have also been known to make temporary groups. In addition, several animals may den together to wait out winter storms and cold temperatures.

Raccoons are usually active from dusk until dawn, resting during the day in trees or den sites. These can be found in wood/brush piles, hollow logs, culverts, under decks, porches, or outbuildings, in attics or chimneys, or abandoned nests/dens of other animals. Raccoons normally will use a site for several days and then move on to another den in the area, even mothers with young that must be moved one by one to the new site. Their favorite habitats are wooded and close to water, like creek banks or lake shorelines, but they can also be creative and use many unusual places when necessary.

Preferred foods include freshwater animals such as crayfish, snails, frogs, and small fish, but raccoons also happily eat small reptiles, birds, and mammals, eggs, slugs, insects, nuts, berries and seeds. They like to pick at road kill and going after a carcass on the road can cause their own demise. Garden produce, especially sweet corn, attracts them. Tree fruit such as apples and plums are a treat, domestic animal enclosures are a temptation, and they relish garbage and pet food. They do enjoy mixing their food with water, so they will gravitate towards areas where



A raccoon foraging parade on the east side of Beaver Lake.

it is readily available, but they are not picky and will forage in places without a water source.

Diseases and health risks

Raccoons are carriers of parasitic round worms that can be transmitted to people who handle either live animals or carcasses. It is highly recommended that disposable gloves be worn if you are going to touch a raccoon and that you wash thoroughly with warm, soapy water after you come in contact with them.

Raccoons also are vulnerable to rabies and can be carriers as well. While it is uncommon for rabies to be transmitted to humans in our region, it is important to keep the symptoms of rabies infection in mind and to

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Your Next Door Neighbors: raccoons *Continued from Page 1*

contact your local health authority or animal control if a raccoon is exhibiting symptoms or if infection is spotted. These symptoms include unusually nervous or aggressive behavior, high degree of activity at the wrong time of day without cause, and drooling or foaminess around the mouth. Any pet animals that spend time out of doors and could encounter a raccoon should be vaccinated against rabies.

Living with the raccoons

Raccoons love our garbage, as well as all the opportunities we provide in urbanized areas for good den sites. Where there is abundant water and forest edges, such as at Beaver Lake, they have ideal habitat and are not going to go away. Hunting and trapping would have to be at a massive scale to put a dent in their expanding populations and so is very unlikely to be a good management tool for today. However, human residents have a number of things that they can do to minimize the possibility of problems with raccoons and thus maximize the enjoyment of living next to them. The following is a list of suggestions to keep raccoons from becoming a problem to you or your neighbors:

No feeding, ever –

Raccoons are wild animals and can provide for themselves to keep their population at reasonable numbers for the environment. Feeding will cause increased density of individuals around your property, which can lead to disease outbreaks. They may lose their fear of you and even become aggressive if the expected food is not offered. Such fearless raccoons also create problems for your neighbors, as they come to expect handouts from all properties in the area or carry their disputes into neighboring yards.

Keep the lid on tight! No access to garbage or compost piles –

One of the reasons raccoons hang around urban areas is the amazing amount of food we put in our garbage cans and compost piles. It's Thanksgiving every day for raccoons in the neighborhood. Lids need to be tightly secured with rope, secure snap-tops, bungee cord, or weights. Some experts recommend chaining garbage cans to a durable stake to prevent overturning. If you compost vegetable wastes, use a worm bin or tightly closed receptacle that can't be opened.

Feed pets indoors and keep them in at night –

Pet food left out over night will be an immediate target, and especially tasty with the pet water dish next to it. Always feed your pets indoors, and bring them in at night to avoid nasty encounters for both the raccoons and the pets. One of the biggest causes of raccoon injury and death comes from dogs, while cats can be injured or killed by raccoons.

For domestic animals such as chickens or rabbits, secure them in a sturdy cage or building at night and keep the food in a tightly secured place.

Eliminate access to possible den sites associated with your buildings -

Favored den sites include attics, chimneys, crawl spaces below houses, porches, and decks, garages or garden sheds, summer houses or gazebos by the lake shore. You can secure spaces against entry by nailing hardware cloth (1/4 inch mesh), boards, or metal slashing across the entrances to these spaces. However, please be sure that you do not trap any animals inside when installing the barriers.



Raccoons are good climbers and use trees for protection and relaxation.

The good news is that most raccoons will leave of their own accord after several days to a week, as their habits include moving their den site frequently. However, mothers with young may stay up to 8 weeks in a particular location. The young in particular may have difficulty leaving a spot such as a dumpster or chimney, so trying to evacuate the family using chemicals, smoke or potentially harmful substances may end in the death of the youngsters and a distraught mother. Calling in animal removal experts is essential in such a case, as well as making sure they know what they are doing.

Finally, have fun watching them from a distance –

Raccoons are highly intelligent, quirky creatures with very agile hands. Watching raccoons forage for food, as well as following their explorations and natural curiosity about what they encounter, can be highly entertaining. Finding their tracks along the beach and playing detective to see where they went and what they did can be absorbing and fun for children. Keeping them as wild as possible will also keep you, your family, pets and property safe for many years. Enjoy!

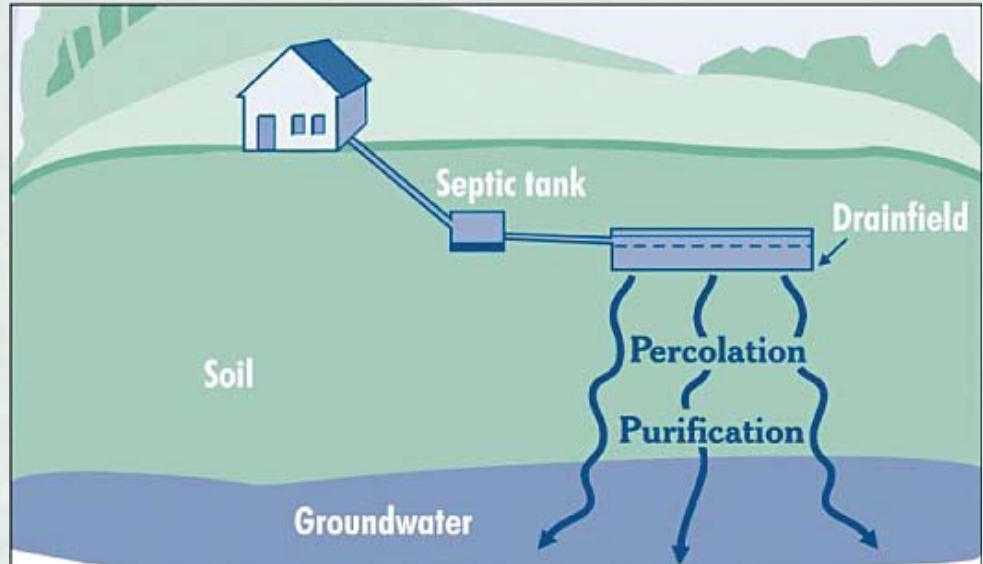


Septic Systems

Homes surrounding Beaver Lake and in the watershed have had access to the Sammamish Plateau Water and Sewer District sewer lines a number of years, but there are still many septic systems in the watershed. Some houses may be using them because a trunk line is not yet available for hook-up, some may be still in use because of hook-up cost, while others may have never been properly decommissioned.

A typical septic tank is a buried, watertight container made of concrete, fiberglass or polyethylene that is designed to pre-treat domestic wastewater. It clarifies wastewater by holding the water long enough to allow the solids to settle out (sludge), be reduced by bacterial action, or float to the surface (scum). Clarified wastewater is pushed into the adjacent drainfield for further treatment every time new wastewater from the house enters the tank. Sludge that accumulates at the bottom of the tank and scum must be removed through periodic pumping and maintenance.

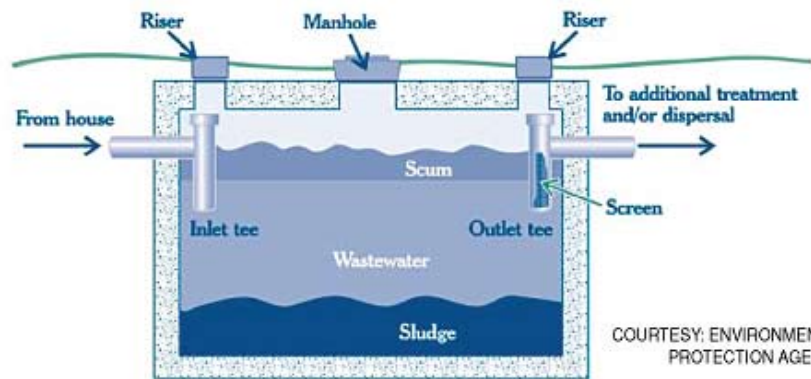
A major problem arises with septic tanks when a tank is no longer watertight. When that happens, water can move into and out of the system in unwanted ways. Usually, water entering the system from the environment causes hydraulic overloading. This taxes the system beyond its capabilities, causing inadequate treatment and sometimes causing wastewater to come to the ground surface. Water leaking out of the septic tank can be a significant health hazard because the leaking effluent has not been properly treated and can add fecal bacteria among other things to the nearest waterbody.



COURTESY: ENVIRONMENTAL PROTECTION AGENCY

Scientists are developing better technologies for treating wastewater. Added to a standard septic system (both diagrams), the new equipment can enhance performance. Some of the technologies pump wastewater over a filter filled with waste-eating microorganisms. Others inject air into the septic system to enable faster growth of bacteria.

Typical single-compartment septic tank with ground-level inspection risers and screen



COURTESY: ENVIRONMENTAL PROTECTION AGENCY

Septic systems are a great way to treat household wastewater but they need some regular attention. Maintaining your septic system can be easy if you stay on top of it. However, leave it for too long and you could face costly repairs, or worse, a very expensive total replacement. Be kind to your septic system, and it will be kind to you!

Here are some helpful hints to make sure your septic system works for you:

- Have your septic tank checked every other year and pumped when necessary.

- Use phosphate free, liquid detergents and wash full loads of clothes. Space out your laundry chores throughout the week to avoid overloading the system on any particular day.
- Use water-saving shower heads and toilets to avoid stressing your septic system with too much input.
- Do not use septic system additives. Keep solvents, cleaners, plastics, paper diapers, and other similar products out of your septic system.
- Do not pave or park on your drain field. The soil needs to breathe.

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Beaver Lake fecal coliform monitoring 2009

This year marked the fifth season of fecal bacteria monitoring in Beaver Lake by the King County Lake Stewardship Program for the Beaver Lake Management District. This study was started because of lake users' interest in knowing if bacteria harmful to themselves or their pets might be in the lake water.

There are several standards in use for categorizing risk associated with human exposure to fecal coliform bacteria. The "Ten State Standard", used by King County's Swimming Beach Monitoring program, calls for closure of swimming beaches when the geometric mean of fecal coliform values is above 200 colony forming units per 100 milliliters (cfu/100mL), or if any single sample is above 1000cfu/100ml. However, this standard is for measured fecal coliform values rather than specifically for *Escherichia coli* (E-coli), which is a good indicator of mammal and human fecal waste; there is currently no government standard for E-coli concentrations, even though evidence suggests that it is a more reliable indicator of health risk than total fecal coliform concentrations.

In the absence of a set standard, the King County Lake Stewardship Program has chosen to use a threshold of 100cfu/100ml, based on a conservative interpretation of the Washington State water quality standards for fecal coliform. While values considerably higher than 100cfu/100ml may not pose a significant risk, repeated values over 100cfu/100ml likely are related to an ongoing source of fecal contamination. It is important to note that this threshold is a guideline used to gauge relative risk and potential point sources, so one-time values exceeding 100cfu/100ml should not trigger swimming restrictions or regulatory action of any kind.

E-coli can originate from several different sources, including pet and domestic animal waste, goose poop and leaking septic systems. Since E-coli move freely through water, results can also be quite variable over time and space. One station may produce a high E-coli count at one time, but measure below detection levels the next. It is important to sample stations repeatedly to look for over-all patterns. To measure E-coli in a cost effective manner, the Coliscan EasyGel method was used. This method has been shown to be a reliable test for E-coli and is approved by EPA in Region 4 (SE United States), although it is not yet officially approved in our EPA region (Region 10).

Between 2005 and 2009, sampling on Beaver Lake occurred once a month between June and October. In 2009, the two stations in the north basin (Beaver-1) were dropped because in the previous four years of sampling, no values of concern had been recorded. Stations in the main basin (Beaver-2) were changed this year to ensure that the stations that have had higher levels of E-coli were continued to be monitored and to add extra monitoring along the shoreline of older properties where potential E-coli contamination could be coming from leaky septic systems. Twenty-three sites were monitored throughout the lake in 2009 (Figure 1).

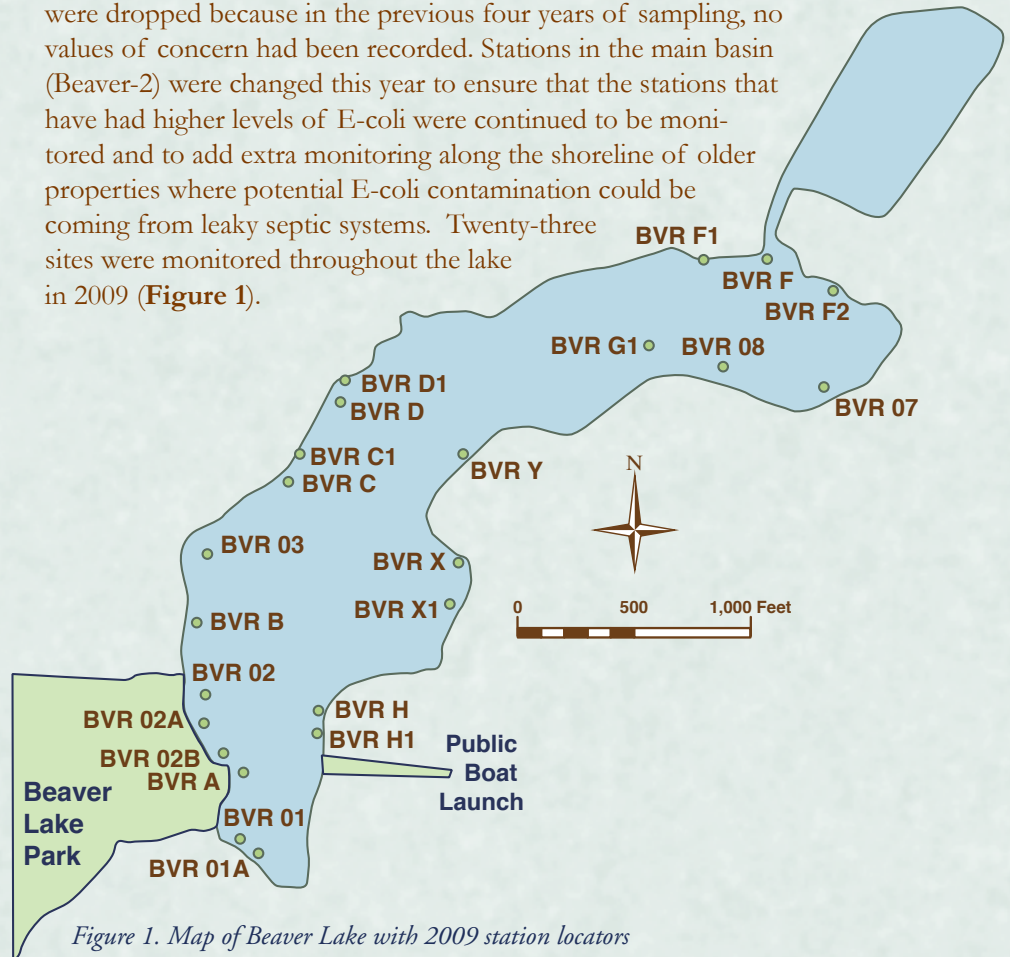


Figure 1. Map of Beaver Lake with 2009 station locators

The data gathered in 2009 followed a very similar pattern as that from the previous four years (Figure 2). No station had more than one value at or above the 100 cfu/100mL threshold throughout the duration of the sampling period. Four stations had one sample with concentrations at or above 100 cfu/100mL, and those samples were mainly from the last

sampling event, which occurred in mid-October. Rain had passed through the area on days leading up to the sampling event, and this suggests that wet weather could have introduced bacteria into the lake.

Although no Beaver Lake stations were in violation of the state standard, continued monitoring is

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Septic Systems

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- Do not plant trees and shrubs over septic tanks or drain fields. The water-seeking roots of these plants can damage your home septic system.

How do you know if your septic system is failing?

- Offensive odors, surfacing sewage, wet spots or lush vegetation over the drain field (especially in summer)
- Toilet back-ups into the tub or shower
- Slow-draining toilets or sinks (check for clogged pipes first)

For more information:

<http://www.wsg.washington.edu/mas/pdfs/SepticSense.pdf>

*All of us with septic tanks,
Give to you our heartfelt thanks,
For putting nothing in the pot,
That's isn't guaranteed to rot.*

*Kleenex is bad, cigarettes too,
Feminine products are taboo,
With your kind cooperation,
We'll keep our tank in operation*



The Beaver Lake Monitor

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desirable to insure that any increased concentrations are detected and do not lead to a health threat. Changes could occur in the future, as development continues, and more pets, people and birds utilize the lake, in addition to septic systems aging. Four stations produced one value of 100 cfu/100mL or higher, suggesting that there is a potential for increased concentrations. It is noteworthy that the BVR 02A, a station located just off the park beach had one result that was higher than the 100 cfu/100 mL threshold in 2009.

This is a site with frequent public access by both pets and children, as well as fishermen, and it should be followed closely.

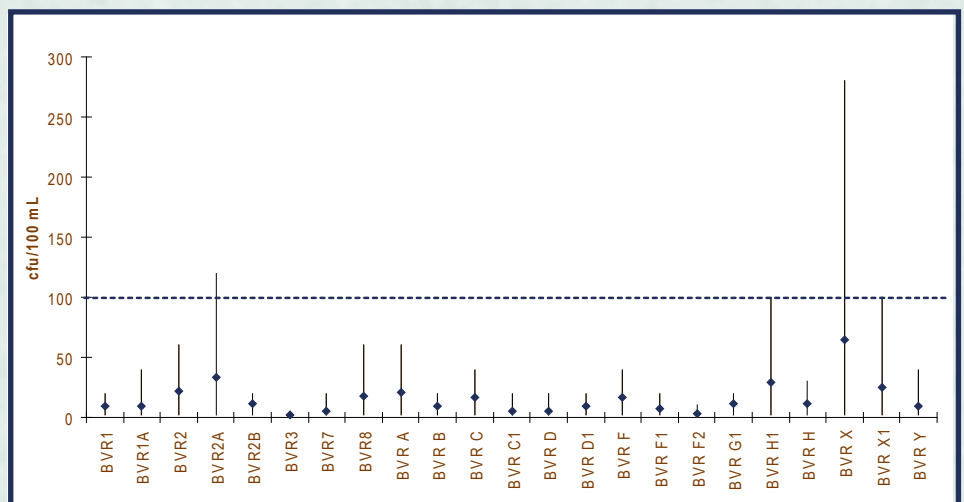


Figure 2. Beaver Lake Stations with maximum, minimum and average E-coli values for 2009.

Water Quality Update

Beaver Lake Water Quality Monitoring Program

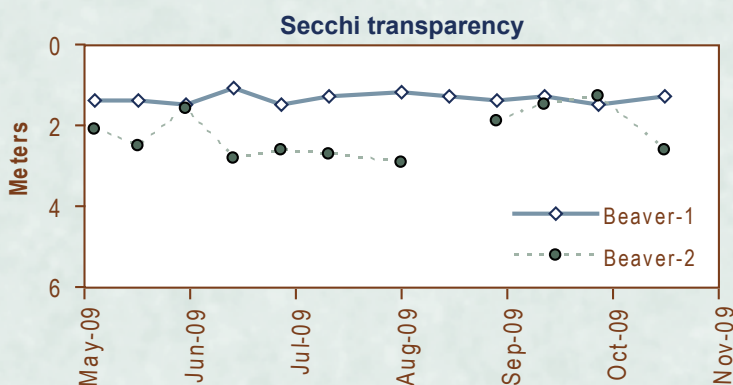
The Beaver Lake Management District (BLMD) contracts with the King County Lakes Program to track water quality late fall through spring in the two creeks that enter Beaver Lake, as well as the two lake basins. In addition, from May through October when the inlets are essentially dry, the City of Sammamish contracts with King County to make lake water quality measurements through the recreational season, with the help of volunteers working with the KC Lake Stewardship Program.

Results

Although water quality refers to many different attributes, in summer there are a number of parameters that are of particular interest: Secchi transparency, phosphorus, nitrogen, and chlorophyll. Changes in these measurements are often associated with increased development and may foreshadow nuisance algae blooms or problems in the future.

In this article, we will refer to the north basin as Beaver-1 and the larger south basin as Beaver-2, similar to past publications and articles.

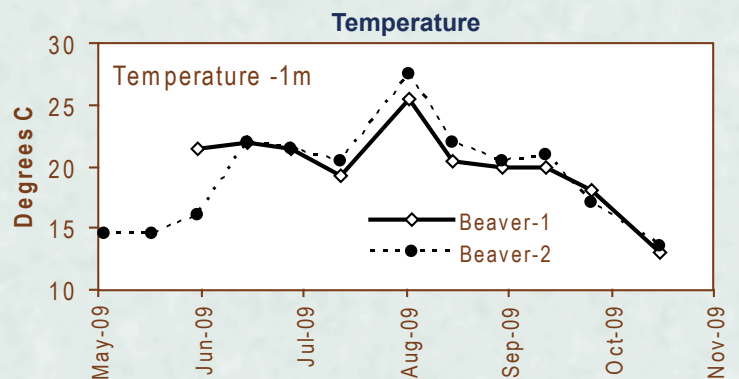
Secchi transparency measures water clarity, usually evaluated in the middle of the lake. While winter decreases in water clarity may be correlated with storm events that bring silt into the lake water, summer clarity is nearly always associated with algae populations and water color. Changes in water clarity often indicate something happening in the lake that should be investigated further.



In Beaver-1, water clarity remained steady through the season, generally less clear than Beaver-2 except for a period in September when they were approximately equivalent. The clarity in Beaver-1 can be explained by the natural tea color of the water due to the high quality wetland feeding the main tributary to the lake, and it often remains relatively constant over long periods of time. Beaver-2 has less natural

color in the water and is generally higher in water clarity than Beaver-1. However, there was a clarity decrease in late summer in Beaver-2 in 2009 due to an unusual bloom of a species of the cyanobacterium *Anabaena*. This bloom colored the water chocolate brown for several weeks and worried many lake users. The genus *Anabaena* has been known to make toxins all around the world, but testing of the bloom showed that in this case it was not doing so. The bloom died out in October with the onset of cooler conditions and shorter days.

Temperature of lake water in the upper part of the water column responds to sunlight, air temperatures and mixing by wind. All lakes show seasonal patterns, but small lakes in particular are sensitive to weather patterns because of their smaller volume of water, in addition to shorter retention times. Lakes in the Puget lowlands often start to warm up by April and begin to cool down in September, concurrently with the changes in day length. Small lakes may receive a great deal of water through ground flow rather than over land flow, and these lakes will often retain cool temperatures in deep water through the summer. Ground water flow is often referred to as “springs” by local residents and can be responsible for suddenly encountered cold patches that people find while swimming.



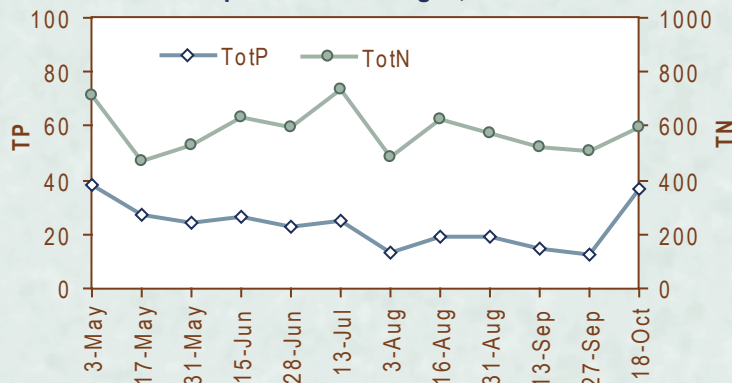
Shallow water temperatures in both basins followed the same trajectory over the summer of 2009, with the hot spell in mid to late July warming the water of the lakes rapidly to maxima of about 27 degrees Celsius, warmer than in several previous years. However, as is typical, the unusual warmth did not last long and the lake basins returned to about 21 degrees Celsius after the hot weather period ended.

Phosphorus is a naturally occurring element that is necessary for life in small amounts. However, activities associated with residential and commercial development can increase concentrations that may lead to more frequent and dense algae blooms – a nuisance to residents and lake users, and a potential safety threat if blooms are dominated by species

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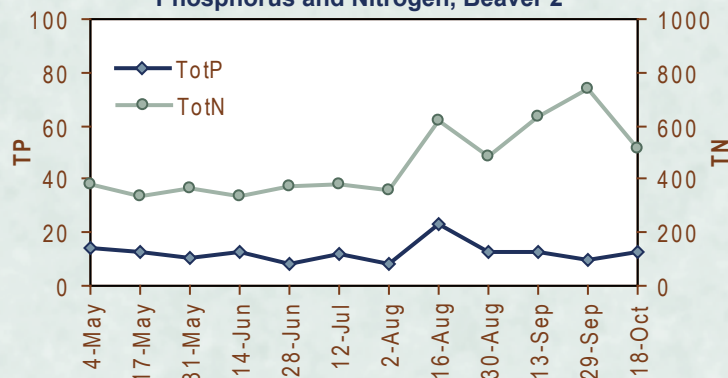
that can become toxic. **Nitrogen** is another necessary plant nutrient, which is usually higher in concentration than phosphorus, but can also impact algae populations. The ratio between the two can determine which algal species do best in the lake water.

Phosphorus and Nitrogen, Beaver 1



In Beaver-1, the ratio between total phosphorus and total nitrogen varied a little throughout the season, but there was no discernable trend over the season. In general, both nutrients are found in higher concentrations in Beaver-1 than in Beaver-2, and 2009 appeared to have the same pattern, although phosphorus climbed on the last sampling date.

Phosphorus and Nitrogen, Beaver 2



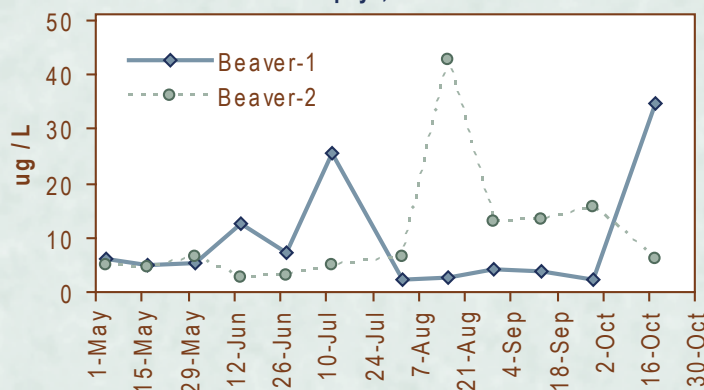
For Beaver-2, the ratio between total phosphorus and total nitrogen similarly remained steady throughout the season, until August when the *Anabaena* bloom began. In this case nitrogen climbed, while phosphorus remained about the same, which is a somewhat unusual finding, especially because the N : P ratio suggested that conditions would not be encouraging for cyanobacteria.

Chlorophyll is a measure of the algal population present, as all algae must have some chlorophyll in order to carry out photosynthesis, which converts nutrients and sunlight into energy and energy storage products.

The chlorophyll measurements were quite different for the two basins in 2009, with Beaver-1 have maxima in July and

October while Beaver-2 reached a peak in August. In past years, chlorophyll has been consistently higher in beaver-1 than in Beaver-2. At this point, there is no reason to think that 2009 was anything other than a year out of the ordinary, but it will be very interesting to see if an algae bloom repeats in 2010 in Beaver-2.

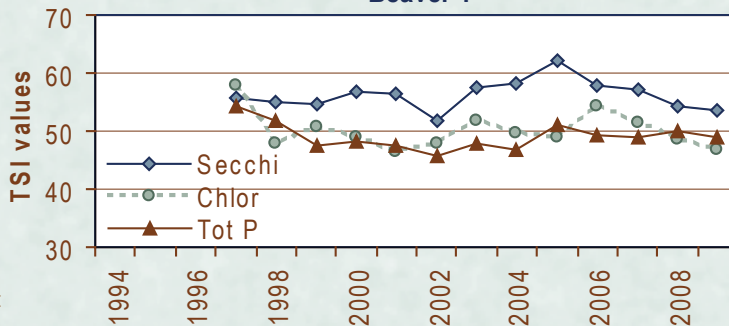
Chlorophyll, Both Lakes



Trophic state indicators (TSI) are values calculated from nutrient, Secchi transparency and chlorophyll measurements that relate to algal productivity. TSI values allow for classification of a water body into 3 different levels of production based on the results: high (eutrophic), medium (mesotrophic) and low (oligotrophic). The threshold between oligotrophic and mesotrophic is a value of 40, while the threshold between mesotrophic and eutrophic is 50.

While lakes can place in any of these classifications naturally, accelerated watershed development and human activities can artificially move a lake from a lower classification to a higher one. This often occurs due to increases in the amounts of nutrients entering the lake, thus stimulating algae growth (which increases chlorophyll) that may also cloud the water, thus decreasing water clarity. Tracking TSI values over time can produce a great deal of information about the direction of water quality in a lake.

Beaver 1



TSI values have been calculated for Beaver-1 since 1997. Nutrients and chlorophyll have tracked each other closely each year and have varied from year to year without

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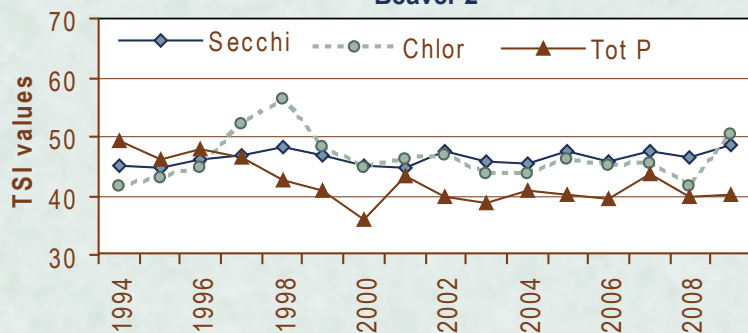
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discernable trend over time, appearing relatively stable at the threshold between mesotrophic and eutrophic conditions. The Secchi TSI has rated significantly higher, related to the naturally dark color of the water, which impacts clarity aside from algae concentrations. Some large algae blooms have been recorded for this lake basin over the years, particularly made by the cyanobacterium *Aphanizomenon*.

Beaver 2



TSI values have been calculated for the Beaver-2 lake basin since 1994. The years 1997-1999 had higher chlorophyll values than the succeeding years, however, the algae bloom in 2009 pushed the TSI value up to the eutrophic threshold. In contrast, the TSI for phosphorus remained at the same

level as in 2008. In Beaver-2, the chlorophyll and phosphorus values do not seem to vary together as closely as they do in Beaver-1, but the TSI for Secchi is closely related to chlorophyll, showing that algae have a significant impact on water clarity. Currently, the lake rates in the middle of the range for mesotrophy.

Summary

Generally speaking, the water quality parameters that have been measured for the Beaver Lake basins have remained stable in recent years, and water quality remains good. An exception was the algae bloom that colored Beaver-2 water for several weeks in 2009, which could have been a result of the unusually warm, dry summer. This suggests that current city land use controls and practices have been effective to date in keeping development from impacting the lake and its beneficial uses.

This does not mean that algae blooms that cloud the water or create other nuisances will never occur, but rather that they should be fairly rare and limited over the long term. We hope that the *Anabaena* bloom in 2009 proves to be just such a case, but will be observing the lake basins closely over the next several years to be sure.

